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ABSTRACT

The author reviews literature on fluency of decoding, sentence awareness or comprehension, and comprehension of larger than sentence texts, in relation to reading comprehension problems in learning disabled children. Initial sections look at the relation of decoding and fluency skills to skilled reading and differences between good and poor comprehenders on decoding tasks. A third section looks at current practices related to decoding fluency, including the Sims Reading Program, the GFB (Gallistel, Fischer, and Blackburn) Sequence, and the New Primary Grades Reading System. The importance of sentence comprehension in reading is the topic of another section. Covered are language development research, language development in learning disabled children, effects of syntactic and semantic manipulations on reading comprehension, and linguistic memory. Subsequent sections discuss research related to text organization and comprehension, differences between normal and learning disabled on text organization and comprehension tasks, and current practices in text organization. (SB)

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THE RELATION OF DECODING AND FLUENCY SKILLS TO SKILLED READING

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INTRODUCTION

The learning disabled reader has been characterized by LaBerge and Samuels (1974) as one who has difficulty mastering each or many of the series variety of subskills required in the acquisition of reading. These subskills may range from discriminating letters and establishing sound-symbol correspondences to integrating word meanings and organizing information for storage. This view of the learning disabled reader coincides with clinical observation. The learning disabled reader is often described as a word-by-word, choppy reader who does not self-correct even blatant errors and who fails to remember or to use information presented in written text as efficiently as a skilled reader. Teachers are continually faced with the frustration of the child who does not progress easily from one step to the next in a learning sequence. For example, the learning disabled child who has learned to read one-syllable words does not automatically apply that ability to multi-syllable word reading. Nor does the child who has mastered word recognition skills at one level, automatically apply these skills to fluent contextual reading.

Two assumptions are made in this paper that are reflected in the choice of topics discussed below. First, it is assumed that the desired end product of reading instruction is the development of reading comprehension strategies to the highest degree possible for any given child. The purpose of reading is to obtain information communicated through written text. Unless a person can use his reading skills to that end, there is no reason to teach him to read. Secondly, the assumption is made that the reading process is composed of separate but interrelated subskills. This suggests that deficits in strategies in any of the subskill areas can adversely

affect comprehension. For the learning disabled child, who does exhibit a variety of deficits in learning subskills of reading, the resulting effects on the comprehension process are crucial. Teachers working with these children must be aware of the possible factors contributing to an observed comprehension problem and be attuned to the possibility that remediation of a comprehension problem might require a multi-faceted approach.

Three broad areas are reviewed in this article because they hold promise for help in understanding reading comprehension problems in learning disabled children and they intuitively coincide with some of the observational evidence of reading behavior in learning disabled children. There is also research evidence that these areas are significant in skilled reading behavior of normal readers. These areas are fluency of decoding, sentence awareness or comprehension, and comprehension of larger-than-sentence texts.

THE RELATION OF DECODING AND FLUENCY SKILLS TO SKILLED READING

Despite arguments that good reading by-passes decoding skills (Goodman, 1967), there is evidence indicating that decoding skills are ready for immediate use by skilled readers and are used, at least to some extent. Rozin and Gleitman (1977) have summarized much of this evidence citing data regarding the similarity between average silent and maximum oral reading rates and optimal rate for understanding compressed speech, phonological errors in adult normal readers, and use of vocalizations in normal adult readers as reading matter becomes more difficult. Related to this last line of research, Hardyck and Petrinovich (1969) used behavior modification techniques trying to inhibit subvocalization by subjects during reading.

Reading comprehension was not affected when easy materials were used. However, when difficult materials were read under conditions of inhibited subvocalization reading comprehension suffered. Rozin and Gleitman (1977) conclude that while there is a shift away from dependency on straight decoding as readers become more fluent, this shift is never complete.

The evidence for the importance of decoding processing in normal fluent readers is accommodated well by LaBerge and Samuels' (1974) proposed model of information processing in reading, which is related to limited capacity and attention sharing theories. In this view, information goes through a series of processing stages. The processing behaviors are learned and can operate at two levels of performance: accuracy and automaticity. At the accuracy level, attention must be focused on the activity, while processing behaviors which are learned at an automatic level are believed to occur without the need of attention. Fluent reading involves mastery of a series of subskills at an automatic level. As subskills are learned to an automatic level, attention is freed and can be utilized at higher levels of processing.

This theory of automatic processes in reading would predict that demands which interfere with the automatic processing in fluent readers would produce adverse effects on comprehension. Klein (1976) set out to demonstrate this effect by observing the effect of different secondary tasks on context utilization in word boundary tasks. Reduced visual clarity, a motor task, and a digit recall task were the interfering independent variables. It was hypothesized that the advantages of having a meaningful context over a random order of words would be reduced by having interfering factors which diverted attention away from the meaningful processing stages. The result confirmed the hypothesis.

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DIFFERENCES BETWEEN GOOD AND POOR COMPREHENDERS ON DECODING TASKS

Golinkoff (1975) has summarized much of the research that suggests that

decoding skills, which she defined as the ability to pronounce words, does differ between good and poor comprehenders. She found in reviewing recent studies that deficits in decoding and in text organization (comprehension of units longer than single words) were more discriminating in detecting these differences than single word comprehension. Decoding skills may be operating in several ways to interfere with reading comprehension.

Misreading words so that they are either nonrecognizable or recognized as different words would have obvious effects on comprehension. There is evidence, at several age levels, that poor comprehenders do make more errors in oral reading than good comprehenders. Fairbanks (1937) looked at errors made by college freshmen in oral reading tasks and found that poor comprehenders made significantly more decoding errors than good comprehenders. Similar results with decoding errors in oral reading were found with fifth grade children (Steiner, Wiener & Cromer, 1971), and with first grade children (Weber, 1970). It appears that poor comprehenders experience considerably more difficulty than do good comprehenders in recognizing and pronouncing words correctly. This deficit would interfere with their obtaining meaning from written texts unless they can adequately derive meaning from the surrounding text without the aid of words they do not correctly decode. This latter possibility is not too likely to occur, however, given other characteristics of decoding in poor comprehenders.

Studies which have assessed decoding skills in good and poor comprehenders have also found that poor comprehenders do not self-correct in the same way or as often as good comprehenders when they read connected discourse. Weber (1970) found that both good and poor comprehenders in the first grade did not correct most of their errors when the errors fit into the syntactic and semantic context of what was being read. However, the good comprehenders corrected 85 percent of their errors that did interfere with the meaning of the text. Meanwhile, poor comprehenders let most of these errors pass by, correcting only 42 percent of them. This evidence is reminiscent of Fairbanks' (1937) findings in which 51 percent of college freshmen poor readers' substitution errors seriously distorted the meaning of the text. None of the good readers' substitution errors distorted the meaning of the text. Good readers in this study also self-corrected more often than poor readers.

There are two explanations for the lack of, and differences in, self-corrections exhibited by poor comprehenders which seem to relate well to other research findings and reading theory. First, according to the model of reading suggested by LaBerge and Samuels (1974), poor comprehenders' lack of self-correction could be explained by a limited capacity system. This theory would suggest that attention to word recognition detracts from these readers' ability to process at the higher level of syntactic

and semantic analysis and could interfere with their ability to use feedback to self-correct errors which distort meaning and grammatical sense. Secondly, these readers might have an impaired linguistic sense of grammatical and semantic references, in addition to decoding problems. This would impede their ability to predict appropriate words that should fit the text being read, as well as their ability to verfiy the appropriateness of what they have pronounced. Research and theory suggesting this explanation will be discussed below. In considering the second explanation, it is necessary also to contemplate the further possibility that slow, laborious decoding might hinder the development (in poor readers) of syntactic and semantic awareness when reading written text. One might aruge that if the reader has not had much experience with reading fluently, he may not be aware of the strategy of using surrounding context to judge the appropriateness of what he has read. Still another factor to consider is that of memory. It may be that slow and laborious decoding may interfere with the ability to self-correct by preventing the storage and maintenance of the preceding context in short term memory long enough to allow syntactical and grammatical analysis to take place (Perfetti, 1977).

Besides using decoding errors, decoding differences have been measured by response latencies to words and pseudowords. Differences in speed of decoding have been found between good and poor comprehenders. Perfetti and Hogabaum (1975) asked subjects to press a button when they were ready to pronounce

a tachistoscopically presented word. Latencies were measured comparing the effects of high and low frequency words--words whose meanings were familiar and those which were unknown to the subjects--as well as nonsense words. Results indicated that latencies for good and poor comprehenders did not differ on high frequency words, but poor comprehenders did not take longer to decode unfamiliar words than familiar words, whereas skilled comprehenders decoded both types of words with equal speed. The same pattern held for the nonsense word task, in which poor comprehenders took longer to pronounce these than good readers. Using decoding speed as the measure, similar results were found by Golinkoff and Rosinski (1976) and by Cromer (1970). An interesting aspect of Cromer's study was that even when poor comprehenders among college freshmen were accurate decoders, their response times to individually presented words were slower than those of good readers. These results would suggest that speed of decoding interrelates with comprehension in ways different from decoding accuracy.

Perfetti and Hogaboam (1975) examined the differential effects of various word experiences on the decoding speeds of good and poor readers. Readers were given experience with pseudowords by either hearing and saying them, or seeing and saying them for a specified number of times (0-18) over the course of three days prior to timing. Skilled readers were faster at each exposure frequency level. Skilled readers also showed gains in decoding speed in the auditory-oral condition with just one exposure per day, while

poor readers required more frequent exposure to increase their decoding speed. Perfetti (1977) concluded that these results indicate either that less skilled readers may have more difficulty establishing a phonological representation of a word in memory, or that they have less stable sound-symbol correspondences than skilled readers.

In another study by Perfetti and Goldman (1976), there was a further investigation of the effects of various experiences on decoding speed of good and poor readers. Decoding speed was measured after providing prior experience with nonsense words in one of four ways:

1. Oral only (subjects heard the word, then said it) about twenty times in three days.
2. Oral with meaning (subjects not only heard the word, but were given much information about its meaning).
3. Decoding only (subjects heard, saw, and read the words).
4. Decoding with meaning (subjects were told and shown the word and given the meaning).

A baseline was determined by giving students a decoding speed test without previous exposure to the word. Both levels of readers benefited from oral experience with the word. The introduction of a meaningful context for the word did not increase decoding speed any more than the speed obtained in oral only or decoding only conditions. Speeds after the decoding experiences

were faster than after the oral experience, but whether these were significant differences was not reported. Finally, it should be noted that skilled and less skilled readers benefited in similar ways by the various experiences but that less skilled readers started out with much higher vocalization latencies than skilled readers. Again, the results suggest that speed of decoding reflects prior auditory and visual experiences with the word. Meaningful associations do not enhance decoding speeds for single words. Meaning appears to be accessed after decoding takes place. Meaningful associations might well enhance decoding speeds in contextual situations, however. In context many factors may act to hinder or enhance decoding speed.

Accuracy and speed of decoding may serve to enable the reader's attention to focus on different linguistic levels such as chunking words into syntactic and semantic units. Research by Clay and Imlach (1971) seems to support such a notion. Children were divided into four ability groups based on speed and accuracy of oral reading. The children with better decoding skills (high accuracy and speed) also read in longer "syntactic chunks." Such findings reflect what teachers describe as reading fluency much more closely than the experimental evidence on fluency which measures latency times for single work recognition tasks or total reading times for lists of words or pseudowords. It seems likely that there is some interrelation between decoding fluency and ability to utilize syntactic and semantic information at the sentence level.

Perfetti (1977) found evidence for this interrelation in a study in which poor comprehenders,who were slow decoders,performed more poorly than good comprehenders on a memory for discourse task. For a further discussion of this research, see the section below on linguistic memory. Unfortunately, the design of the research does not enable the effect of rate alone to be parceled out. Studies should be done to compare readers who have equal abilities in oral syntax comprehension and other oral language tasks, but who differ in reading rate, in order to investigate the effect of rate on comprehension.

CURRENT PRACTICES RELATED TO DECODING FLUENCY

Some remedial programs for teaching learning disabled children to read incorporate timed practice into their procedures. The SIMS Reading Program (1974) in Minneapolis and the GFB Sequence (Gallistel, Fischer and Blackburn, 1978) both suggest speed drills on words that the student has learned to decode. Both these programs base their speed-drill components upon research done at the University of Washington on multiple corrective timings (Tamaras, 1974; Willis, 1974). Speeds for words in isolation are charted daily, with a suggested goal of 60 words per minute. The aim is to have the decoding skills become automatic for the student so that he can progress beyond word-by-word reading, thus freeing him to attend to the more meaningful aspects of the material. Spliced speed drills (SIMS, 1974)

are a variation of the idea in which one or two word families are used to form the speed drill or a few words are repeated often on the page to be read. Timed reading of a few familiar words on patterns enables the child to achieve quick success at the task and to experience the feeling of rapid word recognition. As the child becomes fluent with spliced drills which can gradually become more difficult, he becomes ready to handle timings on drills that include many different words which adhere to the syllabic principle being developed (closed, silent etc.).

Research data on the effect of timings in the SIMS program have shown positive results on speed decoding (Rothenberg, 1975). Unfortunately, the effect on comprehension has not been assessed.

Timing words per minute while reading in context is also suggested for students who read laboriously (SIMS Program, 1974). It should also be noted that both the SIMS and GFB programs incorporate reading in phonetically controlled reading materials as an integral part of providing continued exposure to new words and word types being studied.

In a description of the use of Applied Behavior Analysis for the development of reading comprehension (Hansen and Lovitt, 1977; Lovitt and Hansen, 1976), the authors reported the effects which a technique they refer to as "skipping

and drilling" has on reading rate, oral reading accuracy, and comprehension. Each day students read orally a 500-word passage and then answered multiple-choice comprehension questions. After baseline data were collected, "skipping and drilling" procedures were instituted. Students were told that they could skip part of their text, if on a given day they scored 25 percent better than their baseline score on oral reading and comprehension. Students who did not do well enough to skip at least once in four days were assigned drill procedures. Drill procedures were varied according to which of the measurements did not meet criterion. The drill of interest here was the drill for rate. Students who did not increase their reading rate by 25 percent had to read several 100-word passages until the rate criterion was reached. Gains for the seven intermediate-aged subjects were noted in measures of number of correct words per minute (baseline, 50.7; skip and drill phase, 60.9) and comprehension scores (baseline, 65.9; skip and drill phase, 77.8). Results were maintained when the intervention was removed. These results are interesting. However, it is impossible to state that increased speeds did have a beneficial effect on comprehension. Hopefully, further research will be done in which skipping and drilling as a contingency for rate is separated from other conditions such as skipping and drilling or drilling contingent upon accuracy or comprehension.

Alice Ansara (1972) suggested an arcing technique to bridge the gap between word-by-word decoding and reading in meaningful units. The pencil is

used at first to focus attention on the elements in words which will aid in decoding the individual words, but in later stages, arcs are made under groups of words as the student reads in phrases, and under syllables in multi-syllable words as the student needs to fall back on his syllabication rules when words do not come automatically or rapidly without the aid. This is a good example of a practice which does take into account the need of a reader to alternate between levels of processing while reading.

Beck (1973, 1977) described elements of the The New Primary Grades Reading System (NRS) which incorporate the idea of automaticity. This system, developed at the Learning Research and Development Center at the University of Pittsburgh, demonstrates a recent attempt to incorporate research evidence concerning effective reading and reading instruction with a curriculum design and materials. Beck suggested that familiarity with words based on repeated exposure is one way to develop automaticity, and NRS insures such exposure by providing levels of instruction where few new elements are added and recently learned words and strategies are repeatedly used in connected text. Another part of the system that Beck believes to be helpful in developing automaticity is the use of games in which traditional game formats (e.g., war and other card games) are adapted to reading single words. This, indeed, seems to be an excellent model for achieving automaticity, since it can incorporate principles of repeated exposure, controlled attention to stimuli and motivation.

THE IMPORTANCE OF SENTENCE COMPREHENSION IN READING

In recent years there has been a burgeoning interest in the use of syntactic and semantic cues in the reading process. Some current models of the reading process incorporate encoding and analysis of this information as important aspects of the total comprehension process. Among these, Goodman (1967) has postulated that reading is a "psycholinguistic guessing game" in which the reader samples the reading selections, makes predictions which conform to syntactic rules and semantic constraints, and tests out those predictions against information on the page. Perfetti (1977) and Perfetti and Goldman (1976) have described a three-level processing model of reading comprehension. The second level involves syntactic and semantic analysis of the sentence, while the first includes a linguistic memory processor.

Davis (1971) found in a factor analytic study that sentence comprehension proved to be a separate factor in reading comprehension, apart from general language and reasoning ability. What might make sentence comprehension an independent aspect of reading comprehension? From recent investigations it seems that knowledge of syntactic and semantic relations might be operating in two different ways at this level of comprehension. First, this knowledge may be interfering with processing the meaning of the sentence. Syntax and semantic elements beyond the reader's level of

knowledge will prevent him from gaining the full meaning of each sentence. Second, there is strong evidence that a linguistic memory processor is important to the initial intake of oral and written discourse. Syntactic and semantic competence may affect the operation of this type of memory (Perfetti, 1977).

Language Development Research

Interest in sentence level comprehension naturally leads into language development research concerned with which syntactic and semantic elements make some sentences more difficult than others at various age levels and, to a lesser extent, with what makes those elements difficult or easy. Much research has been carried out on the development of language in young children (under age six), while relatively little has been done with the language development of school age children. Also, more research has been carried out on the development of syntactic structures than on the acquisition of semantic constraints and frames of reference.

There is a body of evidence indicating that syntactic development continues into the school years. Bormuth, Carr, Manning and Pierson (1970) investigated the comprehension of 25 syntactic structures in fourth graders. The percentage of students getting items correct was determined. Surprisingly, the fourth graders did not do well on many of the structures. The lowest

level of performance occurred when comparatives were used and the elements to be compared were equal (e.g., Joe runs as fast as Bill). Sentences containing subordinate clauses in which the two actions occur simultaneously (e.g., As we entered, the curtain rose) were also among the difficult structures for fourth graders. Both of these structures counter expectations based on experience with variation of a structure more easily comprehended. For example, comparatives in which the compared elements were unequal had the highest percent of correct responses. Perhaps the difficulty with harder structures is derived, in part, from dealing with changes in use and meaning of a syntactic form which alter expectations. Thus,it appears that subtle differences in syntactic structures with semantic factors entering in,may be partially responsible for the continuing language development of school age children.

Athey (1977) reported findings on the development of children's comprehension and use of conjunctions and other semantic and syntactic structures. Hutson and Shub (1974), reporting on the use of and by first, fourth, and tenth graders, found a progressive trend in usage from random and inappropriate (by adult standards) usage at grade one, through use to join similar elements, to complex uses such as designating a causal relationship between the elements (e.g., The dog bared its teeth and Billy ran) or opposition (e.g., Don is tall and John is short) (Athey, 1977, p. 74). Athey concluded that these advanced uses of the conjunction require the child

to draw inferences, which is the reason for the long developmental trend. Stoodt (1972) also found developmental trends in the acquisition of conjunctions.

Similar trends have been found for negation (Neimark and Slotnik, 1970; Bloom, 1970, McNeill and McNeill, 1968). The research evidence suggests that in the case of negation, development of comprehension is both a syntactic and a semantic matter. Evidence of syntactic difficulties includes the fact that negation takes more processing time in reaction time experiments than other types of sentences (e.g., Wason and Johnson-Laird, 1972). On the semantic side, Bloom (1970) found evidence of the use of negation (non-existence, rejection, and denial) to signify different meanings for children at different ages. These findings remind us of the difficulty of separating syntactic and semantic factors in the language development of children. Similar research exists on the development of other parts of speech and sentence transformations, but this body of research is not nearly so complete as would be desirable.

Carol Chomsky (1972) provided more information concerning the process of language development in children between the ages of five and ten. She isolated several structures which differentiated among age levels. In addition to responding verbally to questions using the structure being studied, children were asked to manipulate objects to demonstrate their

comprehension of the item. The children's answers and demonstrations indicated confusions related to deleted noun and verb phrases. The situation required the children to assign subjects to verbs (easy to see, promise and ask constructions) and to determine what action was being compared ("although" task).

Successful responses would seem to require a child to be able to fit the meaning of a sentence onto a cognitive representation of the relations expressed in the sentence. An inability to do so might suggest that the cognitive structure was not available to the child or that he could not match the sentence to existing knowledge structures. Slobin (1971) discussed this latter type of difficulty when he suggested that the difficulty in processing passive sentences may be due to the reversal of usual subject-object order which was also the order in which sentence elements were represented in picture stimuli. The first type of difficulty is suggested by Piagetian research demonstrating that development of cognitive structures precedes linguistic development (Inhelder and Piaget, 1964).

Further exploration into the types of syntactic and semantic processing problems encountered in normal development would be very useful for teachers and clinicians working with oral language and reading comprehension in children. There are many gaps in our knowledge. Work such as Chomsky's (1972)

in which children must demonstrate the reasoning behind their comprehension responses would help clarify the processing confusions that children have and lead us toward more systematic and insightful diagnosis and remediation procedures.

Other research which would be helpful to future understanding of the reading process would be studies comparing comprehension of specific syntactic and semantic structures to reading rate at various age levels of material containing those structures.

Language Development in Learning Disabled Children

There has been a shift in recent years from conceptualizing learning disabilities as primarily handicaps in perceptual processes toward thinking of them as a verbal deficit (Vellutino, 1977). Results from several studies have suggested that characteristics such as word and letter reversals, which were thought to reflect perceptual confusion, are more likely labeling difficulties (Liberman, Shankweiler, Orlando, Harris, & Berti, 1971). Others (Vellutino, Steeger and Kandel, 1972; Vellutino, Smith, Steger and Kuman, 1975) found supporting evidence for this idea. This shift in focus in learning disabilities research, along with research development in the relation of oral language comprehension to reading, has raised interest in studies of language development in normal and learning disabled children.

Learning disabled children may possess a variety of language comprehension deficits. Wiig, Semel & Crouse (1975) found that learning disabled children (ages 8-10) who were not thought to exhibit overt speech or language disorders, and high risk preschoolers, performed significantly worse than their control groups on the Berko (1958) test of morphology. Vogel (1974) found similar results. Wiig and Semel have continued to investigate the language problems of learning disabled children (Wiig & Semel, 1973, 1974a, 1974b). They found that comprehension of various logico-grammatical structures (comparative, familial, temporal, spatial, and passive relations) was deficient in learning disabled adolescents (Wiig & Semel, 1974b). Wiig and Roach (1975), using a sentence repetition task, found that learning disabled children performed poorly compared to their normally achieving peers. Particularly discriminating were sentences that violated semantic rules, sentences with either correctly placed or incorrectly placed modifier strings, syntactically complex sentences, and random strings of words. Further data and clinical observations concerning the language deficits of learning disabled children are summarized by Wiig and Semel (1976).

The language comprehension and processing problems learning disabled children exhibit are surely related to their processing of written language. Two areas of research follow that seem to demonstrate the inter-relation of both good and poor readers' comprehension to language abilities and which suggest the possible mechanisms involved.

Effects of Syntactic and Semantic Manipulations on Reading Comprehension

If we assume that understanding the syntactic and semantic relations that are inherent in sentence comprehension is basic to reading comprehension, then we would predict that altering these relations within the text would affect normal readers' comprehension.

Several studies have found that manipulation of language patterns affects comprehension. Ruddell (1965) found that comprehension improved when passages were rewritten in language patterns that children use while keeping vocabulary, sentence length, and subject matter constant. Gibbons (1941) found a high correlation between ability to discover relationships between parts of sentences when presented with disarrayed phrases and both ability to understand the sentence (.89) and total reading achievement (.72). Siler (1974) created a text in which violation of syntactic and semantic rules occured. Syntactic violations had a particularly adverse affect on reading performance of the second and fourth graders studied. Similar results were found by Epstein (1962).

Cromer (1970) compared the performance of two types of poor readers and their controls on reading materials that systematically encouraged or discouraged the use of meaningful units. Different group readers had adequate IQ and vocabulary scores but were poor comprehenders when compared to their control group, who were good readers. The poor readers who were classified as deficit readers were matched with their controls in IQ,

but had inferior vocabulary and reading comprehension scores. Sentences from reading materials were presented in four conditions: regular sentences, sentences in which meaningful word phrases were marked off for the reader, sentences in which fragmented groupings of words were marked off (these were not meaningful phrases), and single word lists.

The difference group, as hypothesized, comprehended best when presented with meaningful phrases. In this condition they did as well as their controls. The difference group's comprehension was equally poor when they read in any of the other presentation conditions, indicating that they do normally read in a word-by-word fashion. Since they already read in this fashion, they were not further disturbed in their reading by the fragmented and single word conditions. Such was not the case for their controls, who showed disruption of reading comprehension in the single word and fragmented conditions while they performed equally well with sentences and meaningful phrases. Their performance indicates that normal readers usually do make use of linguistic information to organize information they are reading into meaningful units. This process can be somewhat disrupted by unusual presentations that are designed to discourage the use of linguistic information about the relationships among the elements being read.

Deficit readers did not do better when they read in the meaningful phrase

condition than in the other conditions. In fact, they did best in the single word condition. Cromer believes that these readers have reading problems that make it impossible for them to benefit from organization of the text, even when that organization is made explicit to them. Presumably, these problems would include lack of sufficient decoding skills, which might cause attention to focus primarily on the elements of words. The single word condition may have ensured that adequate attention was diverted to that level of processing.

In a related study, Wisher (1976) conducted two experiments with normal college students to see if prior knowledge of the syntactic structure of a sentence would reduce the time and effort required for syntactic analysis. In the first experiment, which was designed to assess the effect on effort, students were given an irrelevant memory task while reading sentences. Sentences were presented in blocks that were either syntactically controlled or syntactically mixed. Under the blocked presentation condition students recalled significantly more of the irrelevant material than in the mixed condition, indicating that building up syntactic expectations did reduce the effort required for processing and allowed attention to be used for other processing. In the second experiment, reading speed was the dependent variable. As predicted, speed was greater in the blocked sentence structure condition.

Wisher (1976) concluded that Jarvella's (1971) suggestion is correct,

that words are held in short-term memory until relations between the words are assigned. When a reader can actively anticipate the syntax, the need to store isolated information and the time to make decisions related to syntactic organization of material is reduced. Poor readers may have difficulty in either the storage or decision processes.

Linguistic memory

Partly deriving from ideas concerning the role of memory in the comprehension of discourse (Jarvella, 1971; Fodor, Bever and Garrett, 1974), Perfetti and his colleagues have postulated the existence of a linguistic memory which has properties apart from those of short-term memory. In their view, parts of incoming verbal discourse, either oral or written, are held in memory in verbatim form. It is beneficial for strings of words to be held in this fashion until the end of the sentence is reached so that the relationship of the parts of the sentence can be established (Jarvella, 1971; Perfetti, 1977). To hold strings of words in immediate memory would require some analysis of the meaning and syntax of the word string thus far entered into the memory. Some research evidence (Perfetti and Goldman, 1976; Perfetti, 1977) seems to argue strongly for such a linguistic memory mechanism.

In one study, Perfetti and Goldman (1976) found that memory for spoken discourse differentiated between good and poor readers in the third and fifth grades while memory for digits did not. Digit-probe and word-probe tasks were used in which the subject, after listening to a string of random

numbers or a string of related words, had to tell what came after the probe digit or word. Since the digit task, which was an estimate of short-term memory capacity, did not differentiate between the two reader groups, the differences between the groups on the memory for discourse task may be seen as a strong indication that semantic constraints and syntactic rules were operating in the encoding mechanism.

In a later study (Perfetti, 1977), the interrelationship of this linguistic memory store and decoding was investigated. Perfetti hypothesized that skilled readers who were both good with language comprehension and fast with decoding may not remember words they have just read because they may be bypassing the phonological representations or developing briefer traces since their skills are so automatic. These skilled readers might remember words from further back in the text because they are effectively combining the parts of the sentence together. On the other hand, the poorer, word-by-word reader may have a stronger phonological trace and therefore have good memory for words just read, but their slowness in decoding may affect memory for words further back in discourse, because working memory is being used for more laborious decoding tasks, and words encountered earlier in the sentence become forgotten.

The results of the study supported this analysis. Poor readers were identified on independent measures as both slow decoders and poor comprehenders. The children were asked to read sentences orally and

silently. Memory probes for words three words back and for six words back in the text were used. Poor readers were able to recall words three words back as well as good readers in oral reading, and slightly better than good readers in silent reading. In contrast, when memory was probed for words six words back in the text, poor readers performed worse than they had on the three word back task, and worse than good readers, who were able to recall words from positions six words back as well as from positions three words back. It appears that poor readers expend so much effort on the decoding process that the earlier parts of the sentence cannot be held in immediate memory long enough to integrate them with the rest of the sentence. An alternative, but not mutually exclusive, explanation would be that poor readers are less adept at processing the individual words into meaningful syntactic units for more efficient processing and further analysis; thus, the earlier information may be lost.

Research exists that indirectly supports both possibilities. In addition to research already cited concerning the decoding difficulties of poor comprehenders (Weber, 1970; Steiner, Wiener & Cromer, 1971; Fairbanks, 1937) and the effect on memory and comprehension of interference designed to make reading material less decodable (Klein, 1976), Buswell (1920) reported on differences in the eye regressions of good and poor readers. Good readers made most of their regressions after relatively long jumps ahead in the text, while poor readers made most of their regressions

within words. From this behavior, coupled with slow decoding rates, the inference can be drawn that effort on the decoding task detracts from the possibility of using linguistic information to encode and store discourse. The second explanation, that poor readers are deficient in the linguistic processes that would aid in the momentary storage of discourse while awaiting further analysis, is suggested by Cromer's (1970) finding that deficit readers were able to comprehend as well as normal readers when material was organized for them into phrases. They seemed to need extra help in organizing the information, although of course that help might be necessary because of their attention being focused on decoding (as indicated by the longer reading times this group took to read words in the isolated word condition despite being able to accurately read the words). Data do exist, however, which strongly indicate that language processing problems exist in learning disabled children (Vogel, 1974; Semel & Wiig, 1975).

The relative importance and possible interactions of decoding speed and syntactic-semantic abilities in linguistic memory processes remain to be discovered. This information would be a valuable link in reading comprehension theory and could have important implications for teaching.

RESEARCH RELATED TO TEXT ORGANIZATION AND COMPREHENSION

In recent years two broad areas of development in research have furthered our understanding of reading comprehension at the larger-than-sentence

textual level. One area, research investigating various theories concerning the representation of textual information in memory, has a theoretical orientation and is currently not particularly concerned with immediate practical applications. The other area, research into mathemagenic behaviors, has more immediate practical application and is less concerned with an overall theory of the reading comprehension process.

Evidence from as long ago as 1894 has suggested that the hierarchical organization of elements in connected discourse has a psychological importance in processing prose. The effect of important and unimportant information has been studied using a paradigm that involves recall of material which has been read or heard. Results indicate that important material is remembered more frequently than less important material (Binet and Henri, 1898; Johnson, 1970; Meyer and McConkie, 1973). For example, Johnson (1970) found that more material, judged by independent rates to be structurally important to the text, was recalled after delays of fifteen minutes to sixty-three days, than phrases which were judged to be less important to the text. The observed effects held under conditions where amount of reading time was determined by the subject and under conditions where reading of the text was paced by the experimenter at a constant, average reading pace. Findings such as these strongly support the idea that organization, as it is perceived to exist in written (or spoken) discourse, reflects in some way the nature of psychological processing which occurs. Kieras (1978) has found that different arrangements of discourse which interfere with coherence and disrupt

initial topicalization (specification of a main point in a topic sentence at the beginning of a paragraph) produce effects on ability to select the topic of the material, reading time, and amount of recall. This finding suggests that conventions of prose writing serve a purpose in facilitating the processing of discourse, yet how this happens in the information processing system is not clear.

Work on developing methods of representing the organization of a text is clarifying the relationships between text structure and psychological processing more precisely. Kintsch's work (1974, 1977) on the theory of propositional structure within discourse has been particularly fruitful. Kintsch (1974) represents text in terms of propositions specifying the structure of the relationships among predicators and arguments. Predicators, specifying the relationship that exists among the arguments of propositions, are usually verbs, adjectives, or sentence conjunctions. Arguments are the nouns which serve various functions within the proposition, such as that of agent, object, etc. A hierarchical arrangement of propositions is determined by patterns of shared elements.

Research evidence supporting the theory of propositional representation of meaning has interesting implications for a theory of reading comprehension. In these experiments reading rate and recall have been used to determine the effect of various manipulations of propositions and arguments in text.

In one experiment (Kintsch and Keenan, 1973), texts of a specified length (16-17 words) varied according to the number of propositions they contained (4-9). Results indicated that reading time depended on the number of propositions in the texts, with each proposition adding approximately one second to reading time. When reading rate was compared with number of proposition corrected recalled, about 1.5 seconds of reading time was added for each proposition recalled. With longer passages (50 words) more additional time accrued for each proposition recalled (4.3 seconds per proposition). A second experiment by Kintsch, McKoon and Kozminsky (reported in Kintsch, 1977) looked at reading rate and recall when the proposition of different arguments contained in texts of the same length and difficulty was varied. They found that passages containing many different arguments took longer to read than those which had only a few different arguments. Despite the longer reading time, recall was equal under both conditions, suggesting students read until they had achieved a certain level of understanding which took longer for passages with many different arguments. These findings are reminiscent of the evidence that redundancy in reading material can make it easier to read. Results from this second study also indicated that superordinate propositions were recalled better than subordinate propositions.

Other models for the representation of meaning have been proposed. These include models which explain the hierarchical importance of elements in prose using applications of schema theory (Rumelhart, 1975; Mandler and Johnson, 1977; Rumelhart and Ortony, 1977). A schema that embodies a

whole text will consist of a hierarchy of subschemata (Rumelhart and Ortony, 1977). Significant portions of a text will fit into the schemata at higher levels of the hierarchy. Persons reading a text will have a sense of comprehension when there is a match between the information they read and various parts of the schema they have developed internally from previous knowledge (Anderson and Pichert, 1978). Anderson and Pichert suggest that schemata may aid in both the encoding and the retrieval of information. In the encoding process schemata may be more likely to exist for important textual elements than for relatively less important textual elements. In the retrieval process recall may be facilitated by cues to employ different schemata as a strategy for recall. A facilitating effect on recall was found when subjects were cued to remember details from a story they had read by thinking from a different person's perspective (Anderson and Pichert, 1978).

Haviland and Clark (1974) have proposed a model of language comprehension at both the sentence and larger text level. They suggest that every sentence contains given and new information. The new information must be integrated with the subject's knowledge of the old information. The subject's associations with the old information might come from either the preceding parts of a passage or general information possessed by the subject.

It is interesting to note that these and other models of representation meaning operate at both the sentence and the larger text level. Kintsch's (1973) findings held for propositions within sentences, as well as for longer units of text. Haviland and Clark's theory (1974) pertains to sentence level analysis, as well as to that of larger text. It should come as no surprise that the logical relationships binding ideas together in prose passages are also the same ones which bind together concepts in a sentence. This just serves to remind us that when we talk of language comprehension in relation to reading comprehension, we are not just talking about the role of syntactic-semantic relationships and vocabulary, apart from the conceptual-logical patterns to which they relate.

Another research approach to understanding comprehension of larger units of text has been the investigation of mathemagenic behavior. Purpose setting activities and posing questions at various times during the reading process have been studied fairly extensively. Frase and Kreitzberg (1975) found that setting specific goals, by giving precise instructions as to where in the text students should look for material to be remembered, produced better learning of material relevant to the instructions when delayed recall was tested. Indirect instructions that required interpreting the instruction, to see which sentence in the text it matched, did not enhance learning to any degree over control conditions in which subjects studied the text without instructions. Incidental learning (learning information not contained in the parts of the text indicated by the instructions) was not

enhanced by any of the goal setting instructions. Frase has done his work with college students. Similar results have been reported by Rothkopf and Kaplan (1972).

Conflicting results have been obtained from studies which investigated the effects of purpose setting on reading performance of elementary students. Generally, some studies indicate the children's comprehension was not improved through purpose setting activities (Farley, 1972; Pettit, 1970). Other studies find that purpose setting does effect comprehension in children. One study (Grant and Hall, 1967) found that comprehension for average readers was improved when purpose setting activities took place, while improvement was not noted for superior or poor readers.

When reader-generated purposes are set, the picture is slightly different. Frase and Schwartz (1975) found that when high school students were yoked so that one generated questions that the other had to answer, both questioners and answerers did better on recall of information relevant to the questions than did students who studied with no questions. As with the Frase and Kreitzbert study (1975), no differences were found between experimental and control groups on incidental learning. Frase and Schwartz (1975) also found that college students who were required to write questions on the material they were studying had better recall of material relevant to their questions than students who studied without raising questions.

The latter students recalled all material with a proportion of correct recall of about .53. It seems, then, for secondary and college students that self-imposed goals in reading do enhance learning of related material. A goal of education might well be to help readers learn to set important and relevant goals for themselves in the reading process. To do this they probably must learn ways to "think" about the material being studied. They should probably match their questions to hierarchies of knowledge as represented in their long-term memory store. This seems quite similar to what Anderson and Pichert (1978) have discussed in reviewing some theories on the representation of text in memory. Students must have some way of utilizing organizational strategies to represent the meaning of what they are reading. Their ability to do so is likely to reflect, in part, the frame of reference they have developed through previous experience and knowledge.

Do the same findings hold for younger children? Henderson (1963) found that elementary school age children differed in their ability to set constructive purposes and in their ability to achieve those purposes. Children who set purposes were also better able to use the purposes set by others to learn relevant information. This finding suggests that children differ in their ability to think about the nature of the subject matter they are encountering in a cognitive sense, apart from the actual reading material itself.

Other studies (Petre, 1970; Anderson, 1971) have shown that comprehension improved both quantitatively and qualitatively when Directed Reading-Thinking Activity techniques were used rather than open-communication system methods. In the Directed Reading-Thinking Activity pupils predict what might occur in the text to be read, then read, and finally prove whether or not their predictions were correct. The teacher's role is to keep the inquiry process active in the child, getting him to predict and justify his predictions both in terms of his current knowledge (prior to reading) and the text (after reading). Related studies demonstrating the effectiveness of these and similar procedures have been carried out by Davidson (1970), Covington, Crutchfield and Davies (1966), Wolfe, Hack and King, (1967).

The research seems to suggest that, while younger children may not be able to make use of purposes set by others, or always to generate successfully and use purposes themselves, they can be guided to develop this skill by various teacher-directed activities which stress advance thinking about text that is to be read and follow-up activities which reinforce the strategies being developed. This idea has intuitive appeal in that it suggests a developmental and learning component to the cognitive skills involved. There is a parallel to this view in developmental memory research. Children develop an understanding of the nature of memory tasks and strategies later than the ability to do certain memory tasks, and yet

the development of meta-memory knowledge enhances children's ability to perform memory tasks. Setting and using purposes in reading might seem to require a certain meta-reading knowledge regarding the nature of the reading comprehension task. Children who can raise effective questions and look for answers to those questions probably demonstrate an understanding of the nature of the reading comprehension process.

It would be interesting and helpful to do cross-sectional research on the type of questions children raise about their reading selections at various age levels and with various types of reading matter. Such research could yield information about the type of organizational structures children can bring to bear on the reading comprehension tasks, as well as what organizational conventions in written text they can utilize at different age levels. Ability to verify different types of predictions should also be investigated. These studies should be done with both oral and written materials, particularly to determine if the written form hinders the verification process.

DIFFERENCES BETWEEN NORMAL AND LEARNING DISABLED ON TEXT ORGANIZATION AND COMPREHENSION TASKS

There is a lack of research looking at learning disabled students' processing of passages of organized text. Most of the recent research in verbal deficits in learning disabled students has been concerned with linguistic

processing at the sentence level. There are, however, a few strands of indirect evidence that suggest that processing of meaning of organized text is difficult for learning disabled students.

Some studies provide correlational evidence that organization of information is a problem for learning disabled children. DeHirsch, Jansky, and Langford (1966) found that one of the variables that correlated with reading success at the end of second grade was ability to organize a story. Fry, Johnson and Muehl (1970) looked at oral language samples produced by good and poor second grade readers in response to twenty picture stimuli. Reading level was determined by performance on the reading subtests of the Metropolitan Achievement Test. The presence of more existence statements (e.g., There is a man.) was one of three characteristics which differentiated between the good and poor readers. Evidence such as this suggests that young learning disabled readers have difficulties with organizational aspects of oral language production. Whether or not these difficulties are also evident in comprehension tasks themselves with the same type of material has not been demonstrated.

Some research findings suggest that learning disabled children have difficulty understanding the logic of linguistic concepts at the sentence level. Wiig and Semmel (1973, 1974) found that these children had particular difficulty understanding statements that contained spatial, temporal, familial, passive and comparative relationships. The logical

relationships expressed in sentences and questions such as, "Sharon finished before Henry. Was Henry last?" can also be expressed through longer texts. One would expect that an inability to understand the relationship at the sentence level is likely to be indicative of an inability to do so in longer textual materials.

CURRENT PRACTICES IN TEXT ORGANIZATION

One of the most widely used methods for helping students learn to derive meaning from large units of text is the SQ3 or 4-R method. Students are taught to survey, question, read, recite, and review, or alternatively, to survey, question, read, recite, write, and review. The students' own questions serve as the framework for their reading and studying. This method and others like it seem to incorporate many of the principles which have obtained positive results in research.

Outlining and note taking are other methods used to help students work with the underlying organization of ideas in textual materials. Underlining important information in texts and writing precis-summaries of material read have also been used in study skill courses to aid in comprehension of ideas in a text.

Courtney (1965) reported that results of using these types of study skills have been mixed. Arnold (1942) did not find that students who used

underlinings, outlining, or summarizing techniques learned material any better than students who simply read and reread the material. However, in looking at student products it was evident that the students were not really very competent in the study skills being used. Barton (1973), on the other hand, did find that students could learn effective outlining skills over a period of one month and that these skills benefited their learning of content. The skill, taught in a history class, also transferred to comprehension in other subject matter courses. Courtney (1965) reported that when sixty college freshmen were informally tested for ability to summarize dictated material, take organized notes on dictated material, and produce an outline of expository writing, no more than half of the students produced what was considered by the investigator to be the essential content. Courtney found the outlines to be disorganized. In an informal survey of students' past experiences with these study skills, only 54 percent remembered having any systematic instruction in these skills. Courtney claimed that most of these students had learned these skills on their own to the degree they used them, and that the students saw little practical value to outlining in studying.

Courtney (1965) pointed out that responsibility for teaching organizational study skills is often relegated to the reading teacher in study skills courses or in the developmental reading program. These courses work on the component skills with little or no application to the content of other courses and subjects in which the students are involved. Courtney

states that studies generally found that required study skills courses are not particularly helpful to the student, although only one specific study was cited (Glock and Millman, 1964) which indicated that a required study skills course was not helpful for above average students. Courtney conclude that it is probably more beneficial to provide practice and application of study skills in the regular class program. This makes sense for several reasons. The student may be more easily convinced of the importance of each skill as he sees its use within required coursework. In addition, he is reinforced for using the skill by more complete mastery of the material. Repeated practice with the skill in the content area subjects would also help develop a habit of using the skill rather than just a knowledge of how to perform the skill. Habitual use is probably a key factor in developing long-term benefits of these skills. Finally, development of study skills within the content areas would enable students to perceive the differences and similarities in the organization of ideas in the various subject areas. This should help them develop a flexibility in using study skill strategies. Alice Ansara (1977) has suggested a similar approach for learning disabled students. One of her suggestions for learning disabled adolescents is that they be given chapter outlines of their textbook chapters with increasingly more information to be filled in by themselves throughout the year as they learn more advanced outlining skills.

As the learning disabilities field has turned away from attempting to train psychological processes and focused more on specific academic problems,

learning disabilities specialists, particularly at the middle school and high school levels, have concerned themselves with their students' need to comprehend textbook information. It has been our impression in supervising student teachers in learning disabilities programs and talking to learning disabilities teachers that the prevalent practice is to use ready-made comprehension and study skills materials, which isolate the skills to be taught and give the students practice in using the skill. Those learning disabilities teachers who do work with their students on the regular course work often help them get through each assignment as it comes along and aide them in test situations by reading the test orally. Rarely is there a heavy emphasis on developing study skills within the content areas in any systematic way.

Some of the materials used merely expose the child to a particular skill by having him do activities without explicit instruction. Other materials do attempt to teach the concept of the skill they are developing in a sequential way. However, all of them suffer from the fact that they use isolated content that is not currently of particular use to the student in helping him understand and succeed in his school work. If work on study skills isolated from the rest of the curriculum is not helpful to students generally, it may also not be helpful to learning disabled students.

There is a great need for materials combining comprehension skills with course work at readability levels that the learning disabled reader can

handle. Ideally, this material should be comprehensive enough so that both learning disabilities specialists and content area teachers could use it to provide the learning disabled child with an integrated experience.

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